

**Remarks/Arguments:**

Claims 1-20 are pending. Claims 1-20 stand rejected.

Claims 1-20 have been rejected under 35 USC §103(a) as being unpatentable over Linfield et al. (US Pub. 2004/0238760) in view of Komori (US 5,937,118). It is respectfully submitted that claims 1-20, as amended, are patentable over Linfield et al. in view of Komori for the reasons set forth below.

Linfield et al. disclose a device for generating terahertz (THz) radiation using a coupling block (5a, 5b, or 5c) that is transparent to the exciting laser light used to generate the THz radiation as shown respectively in Figures 2a-c. This coupling block is explicitly taught to be transparent to the exciting laser light and is designed to improve emission of THz radiation by decoupling the orientation of the THz radiation generating dipoles generated in semiconductor 3 from the angle of the emission extraction surface as described in paragraphs 9-12 of the Linfield specification.

Komori discloses a method and device for generating THz radiation in a quantum well (QW) structure. Exemplary quantum wire QW structures (layers 29 and 30) are shown in Figures 15A and 15B. These quantum wire structures, described in column 12, lines 41-59 of the Komori specification, are formed in grooves 28 on substrate 21 and are explicitly not part of the substrate.

The present invention, as recited in amended claim 16, contains a feature which is neither disclosed, nor suggested by Linfield et al. or Komori, namely:

...providing a semiconductor substrate having... an integral grating structure;...

...creating a photo-generated dipole emitting terahertz radiation,

the photo-generated dipole oriented by the grating structure of the semiconductor substrate to emit terahertz radiation having power at least about  $n^2$  times higher than the power of the terahertz radiation radiated by a photo-generated dipole which is not so oriented. (Emphasis Added)

These features may be found in Applicants' specification, for example, at page 17, lines 3-17, or at page 18, line 13, through page 19, line 15.

Independent apparatus claim 1, as amended, includes elements to perform this feature. Thus, the present invention, as recited in claims 1-9 and 14-20, as amended, involves improving the emission of THz radiation by using an integral grating structure formed on the surface of the substrate to orient the photo-generated dipole created in the substrate material.

Linfield et al. use a separate, transparent material to orient an emission extraction surface relative to the dipole. The Examiner has readily admitted on page 3 of the Office Action that Linfield et al. do not teach the use of a grating structure having an apex angle of 90°. Applicants note that Linfield et al. neither teach nor suggest the use of any grating structure to orient the photo-generated dipole created in the substrate material.

Komori has been cited to overcome this deficiency of Linfield et al. Komori generate THz from quantum well structures, such as the quantum wires cited by the Examiner in Figures 15A and 15B, not from the substrate material as recited in independent claims 1 and 16, as amended. Further, the THz radiation of the device of Komori is generated due to a quantum beating phenomenon rather than due to classical dipole radiation as recited in independent claims 1 and 16, as amended. The devices of both Linfield et al. and the present invention generate THz using classical dipole radiation. However, there is no teaching or suggestion that the devices disclosed by Komori may be used to generate THz using classical dipole radiation. Thus, Komori cannot make up for the deficiency of Linfield et al. with regard to these claims.

Therefore, for the reasons set forth above, independent claims 1 and 16, as amended, are not subject to rejection under 35 USC §103(a) as being unpatentable over either Linfield et al. in view of Komori. As claims 2-9, 14, and 15 are dependent on claim 1 and claims 17-20 are dependent on claim 16, these claims are not subject to this rejection as well.

The present invention, as recited in amended claim 10, contains a feature which is neither disclosed, nor suggested by Linfield et al. or Komori, namely:

...a structure of a polytetrafluoroethylene base with an InAs film  
forming a grating on the surface of the semiconductor substrate.  
(Emphasis Added)

These features are found in Applicants' specification, for example, at page 17, line 19, through page 18, line 2.

Neither Linfield et al. nor Komori disclose a structure formed of a polytetrafluoroethylene (Teflon<sup>™</sup>) base with an InAs film. Linfield et al. explicitly require that the materials used for different components in their devices have substantially the same refractive indices, paragraph 34, but Teflon<sup>™</sup> and InAs have significantly different refractive indices at all wavelengths. Komori explicitly identifies substrate 21 as a semiconductor substrate. Teflon<sup>™</sup> is an organic polymer and not a semiconductor. Thus, neither Linfield et al. nor Komori teach or suggest a structure formed of a Teflon<sup>™</sup> base with an InAs film as recited in independent claim 10, as amended.

Therefore, for the reasons set forth above, independent claim 10, as amended, is not subject to rejection under 35 USC §103(a) as being unpatentable over either Linfield et al. in view of Komori. As claims 11-13 are dependent on claim 10, these claims are not subject to this rejection as well.

In view of the amendments and arguments set forth above, Applicants respectfully submit that the above-identified application is in condition for allowance, which action is respectfully requested.

Respectfully submitted,



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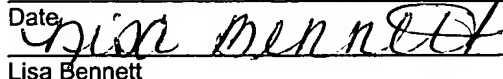
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